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How Much Do Exports Matter for China's Growth?

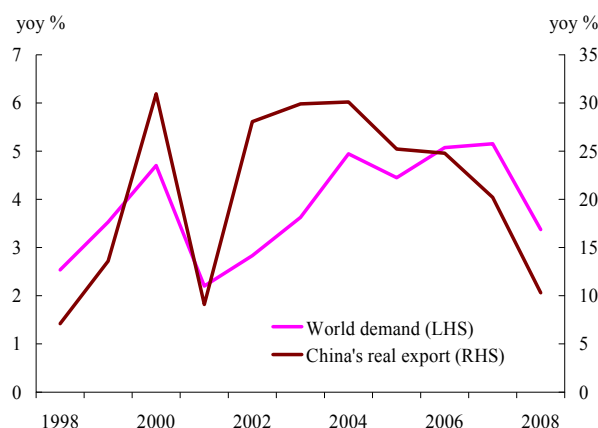
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The sharp deceleration in China's economic growth in recent months, as the economy has been weighed down by the collapse in external demand, brought to the fore yet again the question of how important exports are in affecting China's economic performance. Using a provincial-level panel dataset, this paper seeks to quantify the impact of exports on China's economic growth, focusing in particular on the often-neglected knock-on effects of exports on investment, employment, income and consumption. We find that a 10 percentage-point decline in export growth has been associated with a decline of about 2.5 percentage points in GDP growth on average. This is much higher than the estimated direct impact of exports on growth. The spill-over effects from exports to domestic demand and employment are found to be positive and statistically significant, and are particularly sizable in regions with greater trade exposures. Indeed, such secondary effects are found to increase rapidly with the size of exports relative to the economy.

I. Introduction

Economic activities in Mainland China (henceforth China) took a sharp turn in the second half of 2008, with the year-on-year growth of real GDP slowing from 10.4 per cent in the first half of 2008 to less than 7 per cent in the fourth quarter, the lowest in seven years. The slowdown occurred as the global economy slumped and China's export growth collapsed (Chart 1), and the contribution of net exports to growth fell considerably. In recent months, news about spreading factory closures and job losses has also emerged, raising concerns about further sliding in economic activities. The degree of the recent slowdown has caught many by surprise, especially those who had taken the "decoupling view" that China's rapid economic growth has had more to do with its expanding domestic market than with the strength of foreign demand in recent years, and thus should not be too much affected by the cyclical fluctuations in the global economy.

Chart 1. World demand and China's exports



Sources: WEO, IMF and staff calculation.

Indeed, the debate about the source of China's growth and the role of foreign demand and exports has frequently come to the centre of policy discussions. While few doubt that outward orientation has played an important role in China's economic growth, the channels through which exports affect growth have remained controversial. The benefit of trade to long-term economic growth is well recognised. By promoting factor specialisation based on competitive advantages, enhancing competition in the domestic market, and enabling knowledge transfer, trade helps to boost total factor productivity (TFP) and improve the growth potential (He *et al* 2008). As productivity increases through these channels tend to be incremental, short-term fluctuations in foreign demand and exports should not affect China's growth very much. That is, if the increase in TFP was the only or the dominant channel through which trade affects China's growth, China should be relatively insulated from the development of the world demand in the short run.

At the same time, there are reasons to believe that exports have much broader impacts on growth than solely through TFP, and foreign demand can be very important for China's growth performance even in the short term. First, foreign demand affects real growth directly through the contribution of net exports. In fact, other work has found that such impact has increased in recent years, reflecting the rise of value added in exports and the increased sophistication of exported products which tend to be more responsive to demand fluctuations.¹ Second, exports, through job creation and the income effect, and increasing economies of scale and encouraging investment, could have substantial spill-over effects on the rest of the economy. For instance, investing on a machinery factory may be driven by the need to export, even though the investment itself is recorded as construction and part of domestic demand in the national accounts. In this light, trade balance, even if it has been rising in recent years, still provides an incomplete and underestimated indicator of the importance of exports to growth.

The empirical analyses in this paper attempts to shed light on the impact of exports (both direct and indirect included) on China's production growth. It also assesses the importance of the often-overlooked spill-over effects from exports to domestic demand by examining the key domestic demand indicators and employment, and argues that the consideration of the impact on growth should take full account of such feedback. More specifically, we examine the effects of exports on production as well as the important driving factors for domestic demand including job growth, household income and expenditure, and investment. The estimation is conducted based on panel datasets that include China's 27 provinces. A panel analysis is useful in this context because it allows us to control for factors that drive cyclical movements at the national level or other relevant factors that affect growth and employment for individual regions, while pinning down more precisely the impact of exports. Provincial data help to provide insights about the spill-over as the effects of exports on employment, investment and consumption should be the strongest locally.

Assessing the impact of exports is important at this juncture when the global economy is deep in a synchronised recession. China's exports are likely to remain sluggish, as we have seen in recent months. From a policy standpoint, a better understanding of the magnitude of the

¹ See Cui and Syed (2007).

influence and the channels through which exports affect the rest of the economy is needed to inform policy decisions regarding the necessary strength of the counter-cyclical policies for short-term demand management. It is also important to the region (including Hong Kong) and many countries in the rest of the world that have relied on China's import demand as a driver for their own growth.

To anticipate the results, the empirical analyses find that the effects of export growth on the growth rates of production, investment, household income and expenditure, and employment are positive and statistically significant. The effects are non-linear – the larger the share of exports in GDP, the greater the impact for each percentage-point change in export growth. For the nation as a whole, we estimate that a 10 percentage-point decline in export growth has been associated with an about 2.5 percentage-point decline in real GDP growth on average, much larger than what could have been expected if only the direct impact of exports is considered.

Our analysis is closely related to other work examining the role of exports in economic growth. The standard export-led growth (ELG) literature typically relies on causality tests to examine whether exports lead growth, and is often based on national data. Empirical studies using this framework have been undertaken extensively to examine the experiences of many economies, particularly those in Asia.² Ljungwall (2006) examines the ELG hypothesis for China's using province data, and concluded that the hypothesis is validated in 13 of the 27 provinces, most of which are around export-oriented eastern coastal areas. He *et al* (2008) examine the causality between consumption, investment and exports across provinces, and found exports granger cause investment for coastal provinces. Another strand of literature focuses on cross-country studies and evaluates whether and how trade contributes to growth. Frankel and Romer (1999) find a statistically significantly and positive relationship between trade volume and income level among countries. Kinkyo (2008) presents evidence that export composition also matters, and countries with greater shares of manufacturing exports tend to be associated with higher economic growth.

Using different frameworks, a number of studies have examined the quantitative impact of exports on employment in China, relying on panel datasets. Fu and Balasubramanyam (2005)

explore how exports and FDI affect China's employment growth, as a test of the "vent for surplus" thesis which postulates that exports provide an effective channel of increasing the demand for labour. Hua (2007) investigates the impact of real exchange rate movements on China's manufacturing employment, and concludes that a real appreciation, through affecting export volume and increasing labour productivity (capital intensity and export penetration ratio), tends to reduce employment. In contrast to these earlier works that have focused exclusively on the job impact of exports, the present paper considers more broadly the impact on production and domestic demand.

The rest of the paper is organised as follows. Section Two sets out the theoretical underpinning to assess the impact of exports on growth and the transmission channels. Section Three documents the stylised facts on China's export and growth performance using provincial data. The main empirical examinations are contained in Section Four, which discusses the estimation framework and data, and presents the empirical results. Section Five concludes.

II. the Determinants of China's Growth

Our consideration of China's growth determinants is based on the standard national account identity where growth is determined by aggregate demand, decomposed according to the sources of demand. That is,

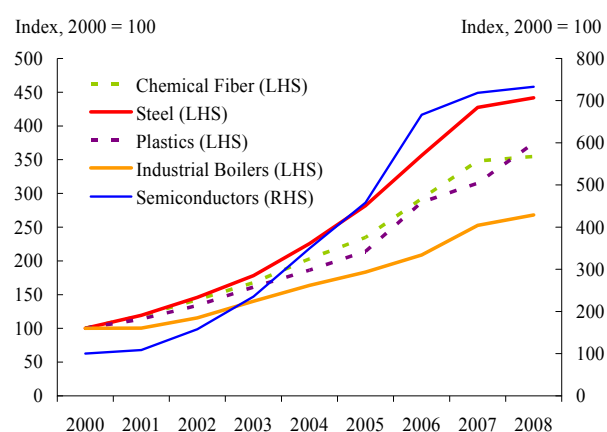
$$(1) \quad Y_t = C_t + I_t + (X_t - M_t),$$

where Y_t , C_t , I_t , G_t , X_t , and M_t represent output, consumption, investment, government spending, exports, and imports, respectively. $(X_t - M_t)$ is the net exports. This contrasts with the alternative of modelling growth from the supply side as in a neo-classical setting where growth is a function of factor inputs and TFP.

² See, for example, Giles and Williams (2000) for a comprehensive survey of the empirical methodology and evidence.

We focus on the demand side of China's growth as in our view it is the strength of the demand, rather than the potential to supply, that has been the key to China's actual growth in recent years. While factor inputs (in particular labour and capital) and improvements in production efficiency are important determinants of China's underlying long-term growth, the supply factors have not constituted

Chart 2. Domestic production



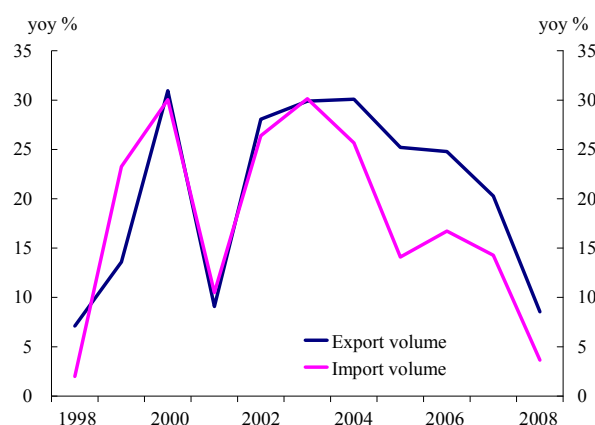
Sources: CEIC and staff calculation.

constraints for China's growth in the short term. The vast rural population has continued to supply a steady flow of migrant workers to join the urban labour force since the start of the economic reform. In recent years, the working-age population as a share of total population has risen significantly because of the baby boom in the 1950s-70s. In terms of capital stock, many have noted the fast investment growth and the rapid increase in production capacity (Chart 2), owing in part to the relatively low production costs such as energy prices and cost of capital. Indeed in many sectors there is vast under-used production capacity. For example, the Government identified in 2006 industries including steel, aluminium, auto, coke as having over-capacity, and noted a number of others in danger of doing so.

In contrast, the demand side has placed greater constraints on China's growth. Consumption growth has been limited by the relatively high precautionary savings and falling household income as a share of GDP in recent years (Aziz and Cui (2007)). Investment growth has been one of the main drivers of the economic growth, although it has been subject to policy controls out of concerns for over-capacity in some manufacturing sectors.

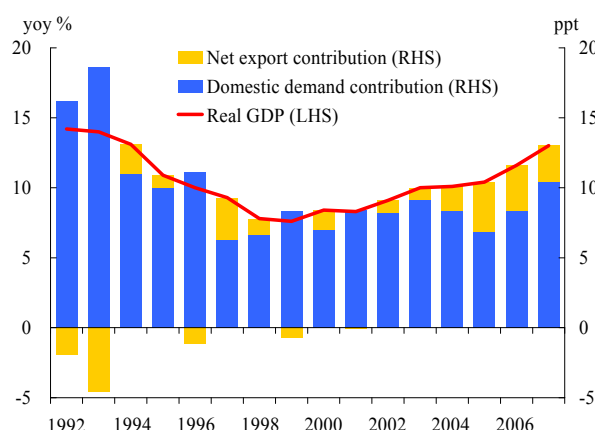
Against this background, external demand has been important in terms of contributing to growth both directly and indirectly. The simple assembly operation was a salient feature of China's trade in the 1990s as large quantities of intermediate products were imported and assembled into final goods, which were then sold abroad. As a result, net exports as a share of GDP remained relatively modest. With the rapid expansion of domestic production capacity, in recent years China has increasingly relied on domestically sourced products for production and exports, and import growth has lagged behind export growth (Chart 3). The direct contribution of trade to China's growth increased significantly, as reflected in the rapid rise in China's trade balance from two per cent in 2000 to over eight per cent of GDP in 2007, and the contribution of net exports to GDP growth rose from an average of five per cent during 1998-2002 to about a quarter during 2003-2007 (Chart 4).

Chart 3. Export and import volume growth



Sources: CEIC, World Bank and staff calculation.

Chart 4. Economic growth by components



Sources: CEIC and staff calculation.

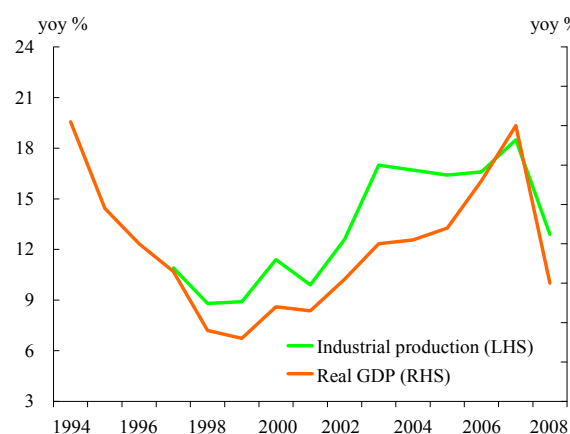
Exports also have spill-over effects on the strength of domestic demand, whereby contributing to growth indirectly. Exports help to create jobs and increase household income and consumption. In addition, exports can stimulate investment by boosting business confidence and increasing the economies of scale, which may lead to a boom in manufacturing investment (accounting for about one third of total investment). Other investment in the areas such as business construction, logistic provision, and information technology could also benefit. The second-round impact is a key channel through which exports affect growth, although unlike trade balance, the magnitude of its contribution is not easily measurable from the headline figures.

III. China's Trade Growth and Regional Divergence

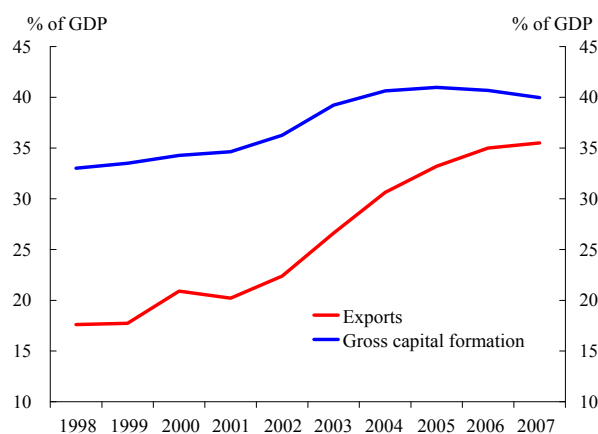
China has achieved phenomenal growth in external trade in the three decades since China introduced the 'open door' policy in the late 1970s. Between 1980 and 2007, exports expanded at an average annual rate of 25 per cent in the each year. The rapid expansion of the external sector has coincided with equally impressive growth of the economy as a whole, which grew annually at 10 per cent on average (Chart 5a). As noted earlier, the direct contribution of trade to China's growth increased significantly in recent years, as reflected in the rapid rise in China's trade balance and contribution of net exports to economic growth.

Chart 5. Major economic indicators

a. Industrial production and real GDP



b. Exports and gross capital formation



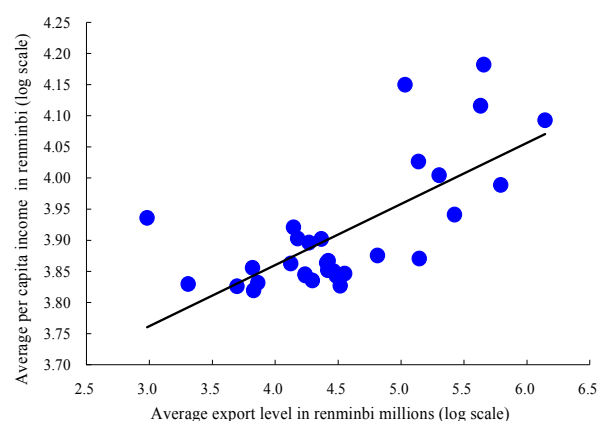
Sources: CEIC and staff calculation.

Other indicators of economic activities such as industrial production and investment have also registered rapid growth, rising by an average of 17.5 per cent and 22.6 per cent respectively each year (Chart 5b). In the meantime, income and expenditure have also been growing consistently, albeit at slower paces than industrial production and investment. Income *per capita* rose from around Rmb 500 in the early 1980s to close to RMB14,000 in 2007. Expenditure *per capita* also has also risen six-fold between 1990 and 2007, from around RMB1,500 to almost RMB10,000. By comparison, employment has seen a much more modest pace, rising around 2.3 per cent each year in the last three decades.

Notwithstanding the impressive national numbers, trade activities are quite uneven across regions. Large exporting provinces, mostly in the Pearl River Delta and Yangtze River Delta areas, account for around 90 percent of China's total exports, while the remainder of export activities is disbursed across the rest of the country. For comparison we divide the provinces and municipalities directly controlled by the central government into two groups: the large exporters and the small exporters. The large exporters include six provinces (Guangdong, Jiangsu, Zhejiang, Fujian, Liaoning, and Shandong), and three municipalities (Shanghai, Tianjin and Beijing). The rest of the provinces are included in small exporters group. The average scale of exports of the big exporters is near 20 times of that of the small exporters (Table 1), and accounts for half of their GDP, a much higher share than the small exporters. Not surprisingly, Guangdong is the largest exporting province, with exports accounting for near 90 per cent of its GDP.³

The large exporters tend to be more affluent than other provinces (Table 1 and Chart 6). Measured by GDP or industrial production, the large exporters are about 2.5 to 3.5 times the average of other regions. In fact, the nine large exporters account for around 60 per cent of the national output. Income *per capita* in the large exporting provinces averaged RMB14,075 in the last five years, compared with that of RMB8,981 in the rest of country. The gap between expenditure *per capita* in the two groups is even greater, with the RMB9,545 for the large exporting group, more than doubling that of RMB4,226 for other provinces.

Chart 6. Income and export by provinces
(average 1998 –2007)



Sources: CEIC and staff calculation.

³ It should be noted that there are often discrepancies between provincial data and national data.

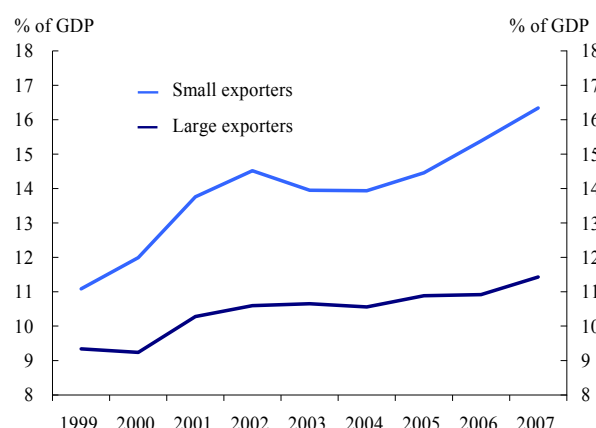
When it comes to growth rates, however, the comparison appears to be more mixed.

Although big exporters tend to enjoy higher income, expenditure, and employment growth than smaller exporters, the investment and production growth in the provinces that export less is actually higher than those in the more export-oriented provinces. Such an inverse relationship could reflect the differences of government spending across regions, as public spending has

been tilted towards less developed regions to reduce the regional differences (Chart 7). Such government support should have greater impact on investment and production growth than on income growth, as infrastructure construction has been one key area of the public support. Notably, for example, since the ‘Go West’ (「西部大開發」) programme started in 2000, the average investment in these provinces have remained about 2 percentage points higher than the national average.⁴

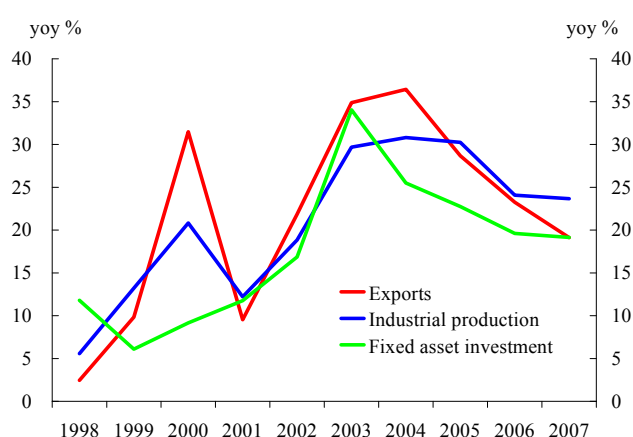
The above consideration suggests that the drivers of investment and growth and their links with exports in inland provinces could be quite different from those in the coastal provinces where exports account for large shares of the economic activities. Grouping the large exporting regions together and considering the average growth rates in these regions, Chart 8 shows that the fluctuations of exports, investment, and production in these regions have been

Chart 7. Government expenditures in large vs small exporting regions



Sources: CEIC and staff calculation.

Chart 8. Exports, FAI and industrial production of large exporting regions



Sources: CEIC and staff calculation.

⁴ The ‘Go West’ programme cover 11 provinces and autonomous regions and 1 municipality. They are Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Inner Mongolia and Guangxi.

remarkably synchronised in recent years, corroborating the view that exports have important spill-over effect to the rest of the economy particularly in these regions.

IV. Estimating the Impact of Exports on Growth and Domestic Demand Using Provincial Data

A. Methodology and data

Our empirical framework considers the impact of exports on several key variables indicating economic activities and demand, using a simple model of the following form:

$$(1) \quad Activity_{it} = f(Export_{it}, Fiscal_{it}, Monetary_t, other\ variables),$$

where the activity variable corresponds to industrial production, investment, household income and expenditure, and employment respectively, in region i and year t . Rather than using provincial level GDP that has been subject to various statistical issues and critiques in recent years, we use the provincial industrial production to measure the strength of production. Fixed-asset investment is used to measure investment, and urban per capita income and expenditure are used to measure household income and expenditure respectively. The estimations control for a number of key variables including fiscal and monetary policy stance: $Fiscal_{it}$, $Monetary_t$. Fiscal policy is measured by the provincial government spending, stemming from the view that public expenditure measures are more effective than revenue measures in affecting economic growth.⁵ Monetary policy is measured by the real interest rate – a variable at the national level. The one-year benchmark deposit rate is used.

The explanatory variable central to this study is export growth ($Export_t$). We also use several methods to capture the possible nonlinear effects of trade on economic performance. One way is to include the ratio of exports to GDP ($Export/GDP_{i,t}$) in the regression. An alternative approach is to include a dummy variable (Big_i) that corresponds to the large exporting provinces. The interactive terms of ($Export/GDP_{i,t}$) and (Big_i) with ($Export_t$) in the

respective specifications can then capture the variations in the impact of exports due to the importance of trade in the economy..

The estimation employs real variables. Investment is deflated by the provincial level fixed-asset investment deflator, and income and expenditure by the provincial consumer price index (CPI). The deflators used for industrial production and exports are the producer price index and GDP deflator respectively at the national level due to lack of data on corresponding price indices for individual regions.

The sample covers annual data from 1992 to 2007. Of China's 31 provinces and municipalities, three provinces with very small export sectors, *i.e.* Tibet, Xinjiang and Qinghai, are excluded. As Chongqing had been part of Sichuan before it became an independent municipality directly reporting to the central government in 1997, we construct consistent data series representing the total of the two. Thus 27 provinces and municipalities are included in the panel. All the data are based on the official data release of the National Bureau of Statistics and are obtained from CEIC.

B. Unit root tests

In order to formulate the empirical specification correctly, the time series properties of the variables are tested. The Augmented Dickey-Fuller and Phillip-Perron tests are used for national-wide data such as the real interest rate, while the Levin-Lin and Im-Peseran-Shin tests are used for provincial level data, *i.e.* panel data. The panel unit root tests suggest that all the activity indicators, $Export_t$ and $Fiscal_t$ are $I(1)$ series—that is, they are non-stationary in levels but stationary in their first differences (Table 2). Thus we use growth rates of the activity indicators and $Export_t$ for the estimation. The $Export/GDP_t$ ratio is stationary in its levels and directly enters the estimation.

⁵ In addition, the Government's support to foster the growth of less-developed regions are largely reflected in provincial government spending, even though the funding may have come from the central government transfers. The aggregate provincial spending accounts for more than three quarters of total government spending.

C. Estimation procedure

The empirical models are specified in a dynamic form which includes a lagged dependent variable, taking the following form:

$$(2) \Delta act_{i,t} = \alpha \Delta act_{i,t-1} + \beta_1 \Delta ex_{i,t} + \beta_2 (ex / gdp)_{i,t} + \beta_3 interact_{i,t} + \beta_4 m_t + \beta_5 \Delta f_{i,t} + \eta_i + \varepsilon_{i,t},$$

where:

- $act_{i,t}$: *logarithms of activities indicators (including industrial production, fixed-asset investment, income per capita, expenditure per capita and urban employment)*
- $ex_{i,t}$: *logarithms of exports*
- $(ex / gdp)_{i,t}$: *ratio of exports to GDP*
- $interact_{i,t}$: *interactive term representing: (1) $\Delta ex_{i,t} * (ex / gdp)_{i,t}$ or (2) $\Delta ex_{i,t} * Big_i$ where $Big_i = 1$ for big exporters and 0 otherwise.*
- m_t : *real interest rate*
- f_t : *provincial government expenditure.*

In Equation 2, subscripts i and t represent province and time period respectively. The parameter α reflects the degree of inertia in an activity indicator, and ' β 's are the impacts of explanatory variables. In specifications without interactive terms, the impact of exports on an activity indicator is given by β_1 and $\beta_1/(1-\alpha)$ for the short and long run respectively. When interactive terms are included, the respective short- and long-run elasticities are $(\beta_1+\beta_2)$ and $(\beta_1+\beta_2)/(1-\alpha)$.

We allow the error term to have two components: a time invariant province specific-effect η_i , and a residual idiosyncratic error term $\xi_{i,t}$. Province specific effects are allowed in order to take into account heterogeneity across provinces. However, the conventional fixed effect estimator, which undertakes the estimation by first differencing (2) would introduce a bias due to the correlation of $\xi_{i,t} - \xi_{i,t-1}$ with the lagged dependent variable. To overcome this

problem, we use the two-step GMM estimator proposed by Arellano and Bond (1991) in the empirical work.⁶

D. Empirical results

Tables 3 - 7 present the estimation equations for the five activity indicators. For each activity indicator, four specifications are reported. Starting with the most parsimonious, the first model only contains the lagged dependent variable and export growth. The second adds a number of control variables, including the export to GDP ratio, and fiscal and monetary policy variables. The third and fourth specifications introduce the interactive term of $Export_t$ with the dummy variable for big exporters and with $Export/GDP_t$ respectively. The Sargan test is undertaken for all the estimated equations. The results suggest the over-identification instruments are valid, providing support to the specifications.

Table 3 shows that the average impact of export growth for the overall group on industrial production growth is positive and statistically significant. Column (2) suggests that on average, a one percentage-point increase in export growth is associated with a 0.1 percentage-point increase in industrial production growth in the short run, implying a 0.12 percentage-point increase in the long run (see Section IV C for the calculation of the long-run impact). However, column (3) suggests that the impact is dramatically different for large exporters group and small exporters group, with an average short-run elasticity of 0.4 for the big exporters, and only 0.06 for the small exporters. As the national sample consists of many more small exporters than big exporters, the relatively small average impact shown in column (2) largely reflects the impact on the small exporters. With the large exporters comprising one-third of the national sample while accounting for more than 60 per cent of the national GDP and production, the impact of exports estimated from the national sample is an underestimation as the estimation has given equal weights to all provinces, small and big exporters alike. Taking into account the relative weights of these provinces in the national economy, the results suggest that a 10 percentage-point decline in export growth is on average associated with about three percentage-point decline in industrial production growth.

⁶ See Technical Appendix for further details on dynamic panel estimation.

The latter corresponds to an about 2.5 percentage-point decline in real GDP growth.⁷ This is about at least twice as large as what could have been expected if only the direct impact of exports is considered.⁸ Column (4) of Table 3 confirms further that the impact of exports on production rise with the share of exports in GDP. For the largest exporters, a one percentage-point increase in export growth is associated with a 0.64 percentage-point increase in the growth rate of industrial production in the short-run and a 0.76 percentage-point increase in the long-run (Table 8).

The estimated spill-over effects from exports to investment, income, expenditure, and urban employment are all positive and statistically significant. The estimated impact of exports on investment is somewhat smaller than that on industrial production (Table 4). Similar to that of industrial production, while the average impact from the national sample is relatively small, the elasticity of investment growth with respect to export growth for large exporters is much more significant (a one percentage-point increase in export growth is associated with 0.18 percentage points increase in investment growth in the short run and 0.23 percentage points increase in the long run, compared to statistically insignificant impact for the smaller exporters). Among the big exporters, the estimated elasticity also varies quite markedly, ranging from 0.12 to 0.46 in the short run (Table 8 and Chart 9b). For income and expenditure, the estimated average elasticities from the national sample are both about 0.04 (Tables 5 and 6). The differences of the spill-over between the big exporters and small exporters are not as large as for investment and production, and the range of the impact among different provinces is marginally wider for income (0.02 – 0.06 in the short run) than for expenditure (around 0.04 – 0.06) (Table 8 and Charts 9c-d).

The estimated average impact of exports on employment from the national sample is fairly mild (Table 7), but again, the national sample masks the important regional differences (Table 8 and Chart 9e). Among large exporters, a one percentage-point increase in export growth is associated with a 0.05 to 0.32 percentage-point increase in employment growth in the short run, depending on the provinces' relative trade exposure. This is consistent with the

⁷ The official GDP growth rate is somewhat less volatile than that of the industrial production. We apply a coefficient of 0.8 (percentage point change in GDP growth for each percentage point change in industrial production growth), based on the historical relationship between the two variables.

⁸ Assuming the domestic value-added of China's exports averaged about 40-50 per cent in the past decade, as many have calculated (see Koopman, Wang, Wei (2008) for a recent paper on this), and considering the average export share in GDP during the past decade, the direct impact of a 10 percentage-point decline in China's export growth is about 1-1.3 percentage-point reduction of real GDP growth.

reported large job losses in the coastal provinces such as Guangdong in the wake of the global economic downturn. As the large exporters have been the main drivers of job growth in the last decades, accounting for three quarters of the total job growth in the country, the fluctuations of export growth also have a substantial impact on the national job market. The estimated impact on employment from this study is comparable to that by Fu and Balasubramanyam (2005) for township and village enterprises (TVEs) at 0.28. However, it's lower than that obtained by Hua (2007) which suggests that a 10 percent increase in exports can raise employment in the manufacturing sector by as much as 12.8 percent.

Among the other variables, real interest rates and government expenditures at the provincial level carry the expected signs. The real interest rate is found to have highly robust and dampening effects on most activity variables, with the biggest impacts on industrial production and employment. Government expenditure is also found to boost industrial production, and, to a smaller extent, income and expenditure. Its impact on investment is less robust, and it does not appear to affect employment.⁹

It is also worth noting that the estimation may have understated the spill-over effects particularly on job and consumption growth, owing to data issues. It is widely known that China's statistics provides a fairly extensive coverage on large and state-owned companies but less well on small and non-state companies; the latter tend to be more dynamic and responsive to market conditions. Another major omission is the migrant workers who have been the most important workforce of the exporting firms. The actual impact of exports on employment would therefore likely to be much larger than that estimated. Also, as noted above, income and expenditure data are from the urban household survey, thus leaving out the impact on migrant workers' income and expenditure which could be larger.

⁹ To check the robustness of the results and consider the potentials economic activities generated from the import side, we also use total trade, *i.e.* exports plus imports, instead of exports as the main explanatory variable also yields similar results. The estimated impacts of total trade growth on activity indicators tend to be larger than that of exports in general.

V. Concluding Remarks

This paper demonstrates the importance of exports to China's economic performance from a demand side perspective. Our empirical analyses find the impact of exports on production and employment and the spill-over to domestic demand are positive and statistically significant, and are particularly sizeable for the more export-oriented regions. As these regions account for a large share of the national economy (about 60 per cent), fluctuations in export growth are likely to have a significant impact nation-wide. We find that a 10 percentage-point decline in export growth is likely to reduce the national industrial production growth by around 3 percentage points. This will translate into around 2.5 percentage-point decline in real GDP growth, which is much larger than the direct impact of exports on GDP growth alone. Among all the demand channels, the estimated response of investment is particularly strong, especially for the main exporting regions. This suggests that a significant part of fixed investments have been made to meet the exporting needs. The impact on job growth, income and expenditure growth from the fluctuations in export growth is also positive and statistically significant, although the statistical issues of data coverage suggest that the actual impact could be much larger than that obtained from the estimation.

The substantial variations across regions in the impact of exports on production and spill-over to domestic demand and employment growth also put the role of exports in China's economic performance in perspective. The results illustrate the importance of trade to the economy in the more export-oriented regions (mostly coastal provinces) – not only do exports and imports account for larger shares of economic activities in these areas, the impact of exports on production and job growth and spillovers to investment and income are also more powerful. These regions account for a substantial share of the national GDP, therefore amplifying the impact of exports in the national economy. At the same time, the inland regions have relied less on exports, both in terms of the size of the foreign trade and the links of exports with other segments of the economy. It is important to note that in the inland areas, public spending has been an important factor supporting growth, especially in recent years, as reflected in the larger share of government expenditure in GDP in these regions than that in coastal provinces. Therefore, the external orientation of the general Mainland economy coexists with the fact that a vast area of inland regions has low export exposure, and other

factors including domestic policies (in particular government spending) may be more important for the latter group.¹⁰

In light of the finding that the spill-over effects of exports tend to be non-linear and rise with the relative size of trade, it is also easy to infer that such spill-over may have increased in recent years. As exports as a share of GDP have risen very fast, from less than 20 per cent in the 1990s to 35 per cent in 2008, the role of exports in directing resources in the economy has become increasingly important. Along with the rise of the trade balance, this has increased the economy's dependence on foreign trade in recent years. In this context, we may expect a larger impact from the external demand fluctuations on China's domestic economy than in the past. Macroeconomic management should take full account of the impact of the external development on the domestic economy, and the counter-cyclical policies in dealing with the current global economic downturn needs to be even more forceful than before.

¹⁰ Of course, even for these regions, there is still spill-over from exports through the income of migrant workers working in the large exporting regions.

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Appendix: Dynamic panel estimation

A general dynamic panel model is specified as follows:

$$(A1) \quad y_{i,t} = \alpha y_{i,t-1} + \beta X_{i,t} + \eta_i + \varepsilon_{i,t}.$$

In Equation A1, subscripts i and t represent province and time period respectively. Also in the equation, $y_{i,t}$ is an activity indicator for province i at time t , while $X_{i,t}$ includes the explanatory described in earlier. The error term consists of a province specific effect η_i and a stochastic error term $\varepsilon_{i,t}$ which is uncorrelated over all i and t .

In this dynamic panel data specification, the dependent variable is correlated with η_i and $\varepsilon_{i,t}$. The least squares dummy variables (LSDV) estimator of this model is inconsistent because while the within transformation eliminates the individual effects η_i , $\Delta \varepsilon_{i,t}$ is in the transformed equation and correlates with the lagged dependent variable.

Arellano and Bond (1991) proposed a generalised method of moments (GMM) to estimate a dynamic panel model, which consists of two steps. The first step estimator is obtained by taking the difference of Equation A1, and utilising the following moment conditions:

$$(A2) \quad E[y_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \text{for } s \geq 2; t = 3, \dots, T$$

$$(A3) \quad E[X_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \text{for } s \geq 2; t = 3, \dots, T$$

That is, all possible lags of the variables $y_{i,t}$ and $X_{i,t}$ are used to generate orthogonality conditions. In the second step, the estimator is constructed by utilising the residuals from the first.

Table 1. Economic performance: big vs small exporters (1992 – 2007)

	All	Big exporters	Small exporters
<u>Level</u>			
Export (USD, bn)	28.2	79.4	4.0
(% of GDP)	(19.9)	(47.4)	(6.8)
GDP (RMB, bn)	709.9	1,213.5	471.4
Industrial production (RMB, bn)	265.3	511.3	148.8
Fixed assets investment (RMB, bn)	317.3	513.2	224.5
Income <i>per capita</i> (RMB)	10,618.9	14,075.2	8,981.7
Expenditure <i>per capita</i> (RMB)	5,935.9	9,545.5	4,226.1
Employment (person mn)	6.2	9.1	4.8
<u>Growth (voy%)</u>			
Export	25.8	25.7	25.9
GDP	13.1	13.8	12.8
Industrial production	25.6	23.1	26.8
Fixed assets investment	22.8	20.3	23.9
Income <i>per capita</i>	9.4	10.1	9.1
Expenditure <i>per capita</i>	12.5	13.2	12.2
Employment	4.8	7.5	3.5

Sources: CEIC and staff calculation.

Table 2. Unit root test results

	LLC test	IPS test
<i>Level</i>		
Exports	24.25 (0.99)	23.91 (0.99)
Industrial production	44.82 (0.99)	44.88 (0.99)
Fixed asset investment	39.92 (0.99)	36.70 (0.99)
Income per capita	16.37 (0.99)	17.74 (0.99)
Expenditure per capita	12.03 (0.99)	16.09 (0.99)
Urban employment	5.71 (0.99)	3.55 (0.99)
Government expenditure	50.16 (0.99)	44.58 (0.99)
Export / GDP ratio	-2.12** (0.02)	-1.36* (0.09)
<i>Growth</i>		
Exports	-13.61*** (0.00)	-12.38*** (0.00)
Industrial production	-2.42*** (0.01)	-0.76 (0.22)
Fixed asset investment	-16.71*** (0.00)	-8.80*** (0.00)
Income per capita	-10.25*** (0.00)	-8.38*** (0.00)
Expenditure per capita	-16.17*** (0.00)	-12.21*** (0.00)
Urban employment	-3.81*** (0.00)	-3.21*** (0.00)
Government expenditure	-12.12*** (0.00)	-8.75*** (0.00)
	ADF test	PP test
<i>Time series</i>		
Real interest rate	-2.37 (0.17)	-1.75 (0.39)

Source: staff estimates.

Table 3. Impacts of exports on industrial production

	(1)		(2)		(3)		(4)	
Δip_{t-1}	0.231 (11.05)	***	0.122 (4.04)	***	0.063 (2.28)	**	0.166 (5.96)	***
Δex_t	0.051 (10.24)	***	0.102 (2.31)	**	0.062 (2.78)	***	0.042 (0.81)	
$\Delta ex_t * Big$					0.342 (9.26)	***		
$\Delta ex_t * (Ex / Ngdp)_t$							0.007 (3.54)	***
$(Ex / Ngdp)_t$			-0.106 (-0.19)		0.263 (1.37)		-0.296 (-1.00)	
rr_t			-0.604 (-6.38)	***	0.071 (0.65)		-1.124 (-9.26)	***
$\Delta govt_t$			0.323 (2.68)	***	0.448 (8.98)	***	0.309 (5.36)	***
Number of observations	322		311		311		311	
Sargan statistic	26.50 [0.38]		24.32 [0.33]		24.61 [0.32]		25.26 [0.24]	

Source: staff estimates.

Table 4. Impacts of exports on fixed-asset investment

	(1)		(2)		(3)		(4)	
Δfai_{t-1}	0.251 (31.34)	***	0.167 (5.78)	***	0.200 (3.02)	***	0.141 (2.68)	***
Δex_t	0.052 (6.69)	***	0.017 (1.76)	*	0.002 (0.08)		-0.028 (-0.79)	
$\Delta ex_t * Big$					0.181 (4.32)	***		
$\Delta ex_t * (Ex / Ngdp)_t$							0.005 (2.26)	**
$(Ex / Ngdp)_t$			0.212 (1.05)		0.758 (3.56)	***	1.280 (2.27)	**
rr_t			-0.214 (-3.47)	***	0.132 (1.41)		-0.094 (-0.80)	
$\Delta govt_t$			0.049 (1.90)	*	0.058 (0.59)		0.126 (0.99)	
Number of observations	334		317		317		317	
Sargan statistic	27.15 [0.46]		24.38 [0.33]		24.93 [0.25]		21.66 [0.42]	

Source: staff estimates.

Table 5. Impacts of exports on income

	(1)		(2)		(3)		(4)	
Δinc_{t-1}	0.073 *** (12.70)		0.032 ** (2.12)		0.094 *** (3.12)		0.081 *** (2.84)	
Δex_t	0.042 *** (22.51)		0.035 *** (5.17)		0.021 ** (2.36)		0.022 ** (1.99)	
$\Delta ex_t * Big$					0.063 *** (5.84)			
$\Delta ex_t * (Ex / Ngdp)_t$							0.00046 ** (2.49)	
$(Ex / Ngdp)_t$			0.062 ** (2.36)		0.072 * (1.84)		0.056 (1.01)	
rr_t			-0.190 *** (-7.76)		-0.115 *** (-3.32)		-0.156 *** (-5.20)	
$\Delta govt_t$			0.125 *** (5.05)		0.125 *** (4.86)		0.107 *** (3.90)	
Number of observations	349		332		332		332	
Sargan statistic	26.12 [0.40]		23.51 [0.43]		24.11 [0.34]		22.69 [0.36]	

Source: staff estimates.

Table 6. Impacts of exports on expenditure

	(1)		(2)		(3)		(4)	
Δexp_{t-1}	-0.026 *** (-7.98)		-0.110 *** (-9.57)		-0.104 *** (-5.76)		-0.107 *** (-7.03)	
Δex_t	0.061 *** (51.28)		0.044 *** (12.76)		0.034 *** (6.33)		0.043 *** (16.15)	
$\Delta ex_t * Big$					0.047 *** (8.54)			
$\Delta ex_t * (Ex / Ngdp)_t$							0.0002 *** (2.84)	
$(Ex / Ngdp)_t$			0.071 *** (4.24)		0.061 ** (2.26)		0.072 (2.45)	
rr_t			-0.217 *** (-5.58)		-0.182 *** (-3.31)		-0.212 *** (-4.36)	
$\Delta govt_t$			0.077 *** (3.41)		0.081 ** (2.50)		0.097 *** (4.35)	
Number of observations	349		332		332		332	
Sargan statistic	25.86 [0.42]		24.75 [0.31]		25.19 [0.24]		24.81 [0.26]	

Source: staff estimates.

Table 7. Impacts of exports on employment

	(1)		(2)		(3)		(4)	
Δem_{t-1}	0.319	***	0.059	***	0.055	**	0.037	*
	(229.03)		(2.97)		(2.30)		(1.73)	
Δex_t	0.032	***	0.008	*	-0.016	***	-0.041	***
	(44.05)		(1.68)		(-2.93)		(-3.33)	
$\Delta ex_t * Big$					0.120	***		
					(5.73)			
$\Delta ex_t * (Ex / Ngdp)_t$							0.004	***
							(3.15)	
$(Ex / Ngdp)_t$			0.215	***	0.274	***	0.080	
			(14.94)		(4.39)		(0.44)	
rr_t			-0.711	***	-0.657	***	-0.689	***
			(-18.79)		(-23.64)		(-36.91)	
$\Delta govt_t$			0.030		0.023		0.024	
			(1.46)		(1.04)		(1.07)	
Number of observations	322		311		311		311	
Sargan statistic	26.01 [0.41]		28.24 [0.21]		25.35 [0.23]		23.41 [0.32]	

Source: staff estimates.

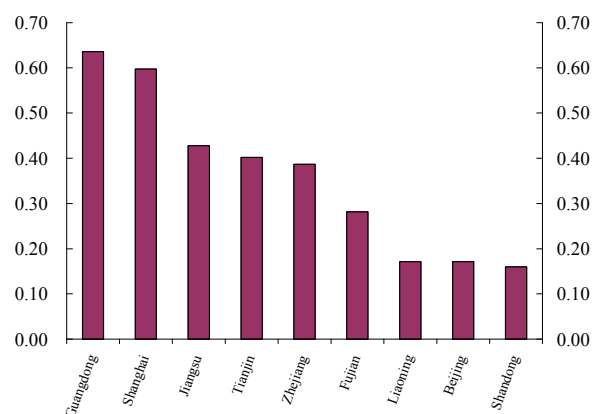
Table 8. Estimated impacts: short-run and long-run

	Short term					Long term				
	<u>Average</u>	<u>Small group</u>	<u>Big group</u>	<u>Lowest</u>	<u>Highest</u>	<u>Average</u>	<u>Small group</u>	<u>Big group</u>	<u>Lowest</u>	<u>Highest</u>
Industrial production	0.102	0.062	0.404	0.032	0.636	0.116	0.066	0.431	0.039	0.762
Fixed asset investment	0.017	0.000	0.181	0.023	0.454	0.020	0.000	0.226	0.027	0.529
Income per capita	0.035	0.021	0.084	0.024	0.064	0.036	0.023	0.093	0.026	0.069
Expenditure per capita	0.044	0.034	0.081	0.044	0.061	0.040	0.031	0.073	0.040	0.055
Urban employment	0.008	-0.016	0.104	-0.023	0.322	0.009	-0.017	0.110	-0.023	0.335

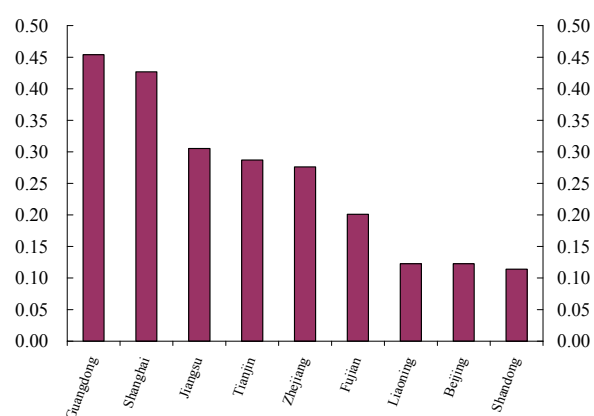
Source: staff estimates.

Chart 9. Short-run impacts of exports on different provinces

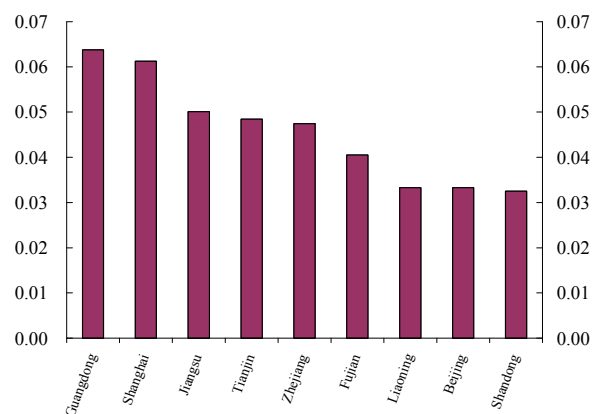
a. Industrial production



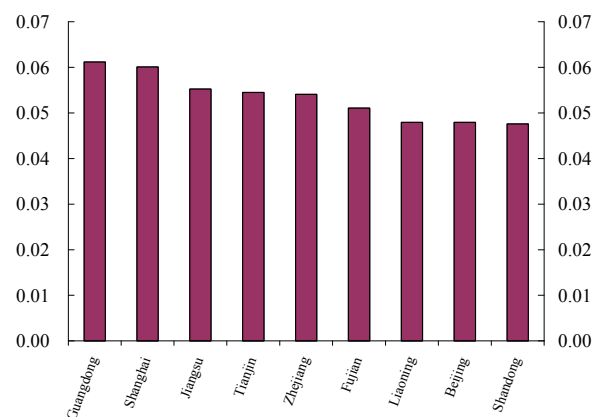
b. Fixed-asset investment



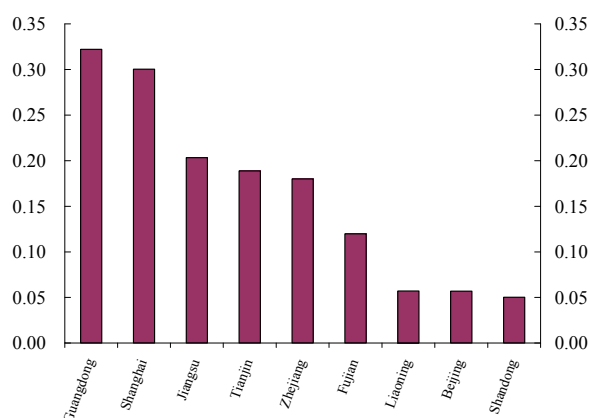
c. Income per capita



d. Expenditure per capita



e. Urban employment



Sources: CEIC and staff estimates.